



Knowledge and Awareness of Articaine Use among Dental Students - A Survey

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Authors' contributions

This work was carried out in collaboration between both authors. Author DD designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author DD and DG managed the analyses of the study. Author DG managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Articaine is an intermediate-potency, short-acting amide local anesthetic with a fast metabolism due to an ester group in its structure. It is effective with local infiltration or peripheral nerve block in dentistry, when administered as a spinal, epidural, ocular, or regional nerve block, or when injected intravenously for regional anesthesia. In comparative trials, its clinical effects were not generally significantly different from those of other short-acting local anesthetics like lidocaine, prilocaine, and chloroprocaine. The aim of this study was to assess the knowledge and awareness of Articaine use among dental students. A cross-sectional study was done to assess the knowledge and awareness of articaine use among dental students. The sample size of the study was about 100 participants and the survey instrument was a self-administered questionnaire administered online. The responses were collected and statistically analyzed. 59% of the students were aware of articaine use in dentistry. The study concluded that there is a moderate level of awareness about articaine use among dental students.

Keywords: *Articaine; regional anesthesia; pharmacodynamics; pharmacokinetics; therapeutic use; tolerability; neurotoxicity.*

1. INTRODUCTION

Local anesthetics block peripheral nerves and are used to prevent pain, to aid in minor surgical procedures.[1] Cocaine was the first reported ester-type local anesthetic for clinical use, in 1886, followed by procaine in 1904. In the search for less allergic compounds with a faster onset, the amide-type local anesthetic lignocaine was synthesized by Swedish chemist Nils Löfgren in 1943 and marketed as lidocaine in 1949. Since then, other amide local anesthetics have been introduced and used clinically for their favorable onset time and duration, eg, Mepivacaine, Prilocaine, Bupivacaine, Etidocaine, and Ropivacaine. Among this group, articaine, originally synthesized as articaine, entered dentistry practice in 1973. Articaine differs from the other amide local anesthetics because it contains a thiophene ring, The thiophene ring allows greater lipid solubility, which facilitates diffusion across the lipid-rich nerve membrane to access target receptors Besides that, articaine contains an ester group, so that hydrolyzation occurs in the plasma by nonspecific cholinesterases, further metabolism, and excretion, primarily in the kidneys. [2] About 90% of articaine metabolized quickly via hydrolysis in the blood into its inactive metabolite articainic acid, which is excreted by the kidney in the form articainic acid glucuronide [3].

Articaine is an intermediate-potency, short-acting amide local anesthetic with a fast metabolism due to an ester group in its structure. It has been reported that administration of Articaine to gingiva infiltrates rapidly and blocks the peripheral nerve in dentistry, when it administered as a spinal, epidural, ocular, or regional nerve block, or when injected intravenously for regional anesthesia. The use of articaine achieves successful pain control in low doses and it is safer and more effective than lidocaine, however, few instances of paresthesia are reported [4].

Dentistry is a dynamic field, with constant advances in products and techniques. One such product is Articaine that has been recently introduced as a local anesthetic (LA) drug. [5]There are wide varieties of local anesthetic agents that practitioners can use that satisfy the requirements for safe, effective local anesthesia in most operative cases. Two distinctive

properties of Articaine related to its molecular structure make it a desirable local anesthetic for clinical use. Articaine is unique among amide local anesthetics due to the presence of a thiophene ring which makes it more soluble. Due to its higher lipid solubility, it diffuses better through soft tissues than do other anesthetics, thereby achieving higher intraneural concentration, more extensive longitudinal spreading, and better conduction blockade [6]. Articaine is a safe, well-tolerated, and effective local anesthetic for use in both children and adults[7]. The aim of this study was to assess the knowledge and awareness of articaine use among dental students.

Previously our department has published extensive research on various aspects of prosthetic dentistry [8–18], this vast research experience has inspired us to research about the knowledge and awareness of articaine use among dental students.

2. MATERIALS AND METHODS

A qualitative, questionnaire-based study was done to assess the knowledge and awareness of articaine use among dental students. A total of six questions were asked to a batch of 100 participants to elicit awareness of articaine use among dental students. The study was done under a University setting. Two reviewers are involved in the study. The data collection was done, the obtained data were tabulated and entered in the MS Excel sheet. Data collection were imported to SPSS, variable definition process was done using tables and graphical illustration.

By using the statistical software Statistical Package for Social Sciences IBM SPSS) version 20 statistical tests like description statistical tests and inferential statistics were done keeping demographical, such as age, gender as an independent variable, and pain as the dependent variable. The data was reviewed by one external reviewer and the data was imported to SPSS and variables defined. Chi-square was done on the data obtained. The type of analysis that was done was correlation and association.

Questionnaire for the study participants:

1. Year of study and Gender

2. Are you aware of the pharmacological effects of Articaine?
3. Are you aware of any adverse effects or anaphylactic reaction with Articaine?
4. Do you prefer Articaine in your daily clinical practice?
5. Do you ask history of drug allergy to the patients routinely?
6. Do you know the composition and chemical configuration of Articaine?

response, it's effectiveness, and the most common indication. Lignocaine and articaine also remain the most commonly used local anesthetic in the United States. Many factors can affect the selection of local anesthetics such as duration of action, efficacy, and toxicity, and a high percentage of the responding dentists (81%) were shown in this study to be unaware of how to calculate the local anesthetic dose. The volume of local anesthetic cartridges used in India is set at 1.8 ml. In order to simplify dose calculations, Becker and Reed recommended that this volume be regarded as being 2 ml, thereby leading to an overestimate of the amount of local anesthetic that is given to the patient [19] and as a result automatically introducing a safety margin.

3. RESULTS AND DISCUSSION

The background of this survey is to analyze the dental students whether they are aware of articaine use among dental students, patient

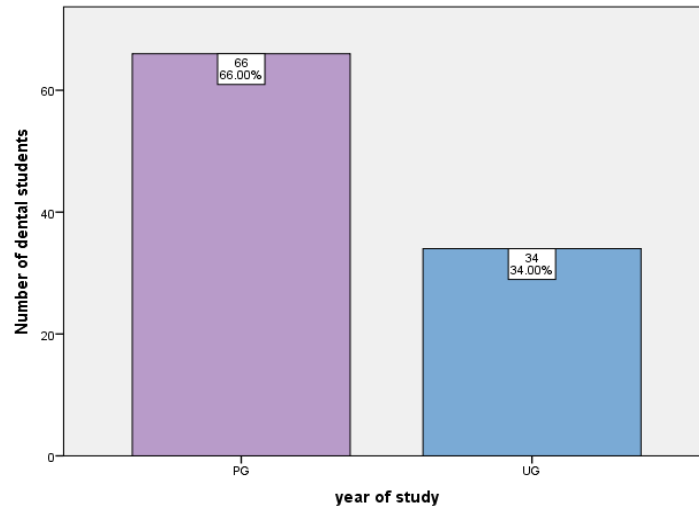


Fig. 1. The graph shows the year of study of students who were aware of articaine use among dental students. X axis shows the age groups and Y-axis shows the number of students who were aware. 66% were postgraduates (purple), 34% were undergraduates (blue)

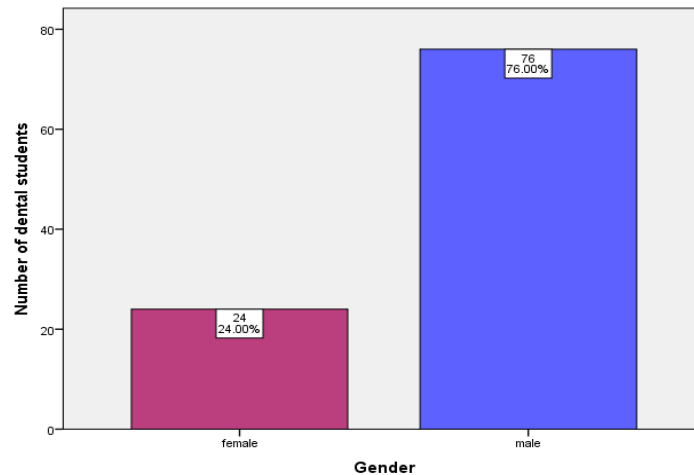


Fig. 2. The graph shows the gender distribution of students who were aware of articaine use among dental students. X axis shows the gender groups and Y-axis shows the number of students who were aware. 24% were female (purple), 76% were male (blue)

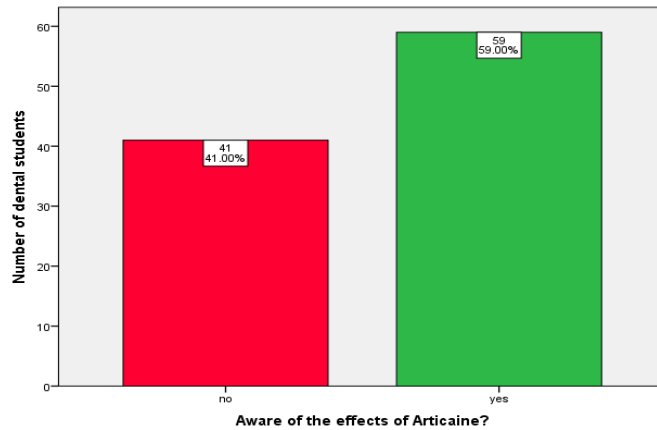


Fig. 3. The graph shows the distribution of dental students who were aware of the effects of articaine. The X-axis shows those who were aware and Y-axis shows the number of students who were aware. 41% were not aware (red), 59% were aware (green)

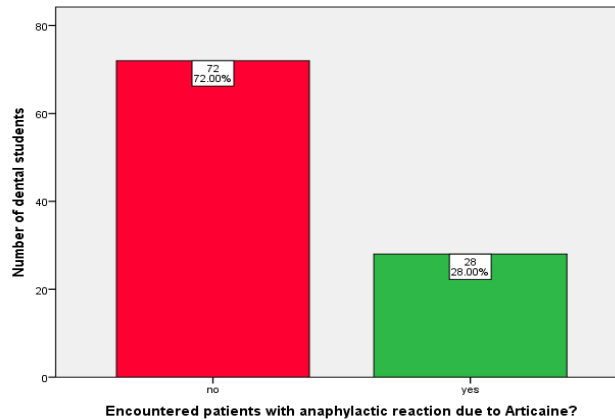


Fig. 4. The graph shows the distribution of dental students who encountered patients with anaphylactic reaction due to articaine. The X-axis shows those who were aware and Y-axis shows the number of students who were aware. 72% were not aware (red), 28% were aware (green)

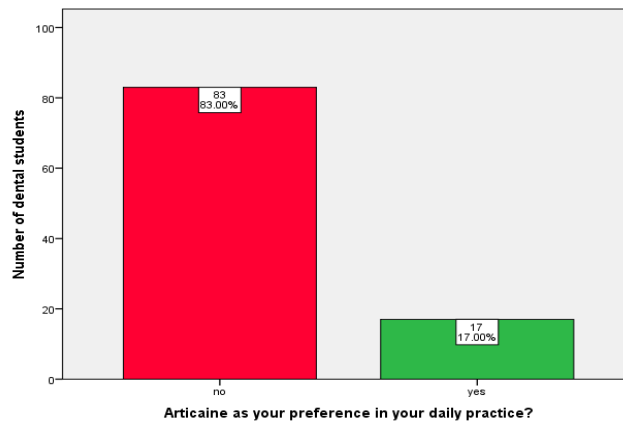


Fig. 5. The graph shows the distribution of dental students who preferred articaine in daily dental practice. The X-axis shows those who preferred articaine use in daily dental practice and Y-axis shows the number of students who were aware. 83% did not prefer the use (red), 17% preferred (green)

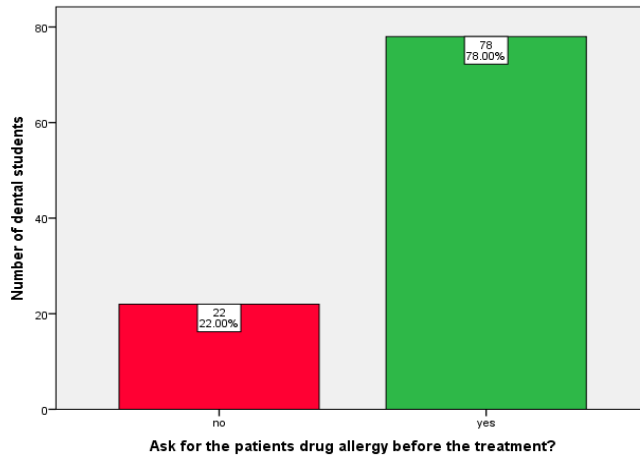


Fig. 6. The graph shows the distribution of dental students who ask for the patient's drug allergy before treatment. The X-axis shows those who ask for the patient's drug allergy and Y-axis shows the number of students. 28% do not ask (red) , 78% who ask (green)

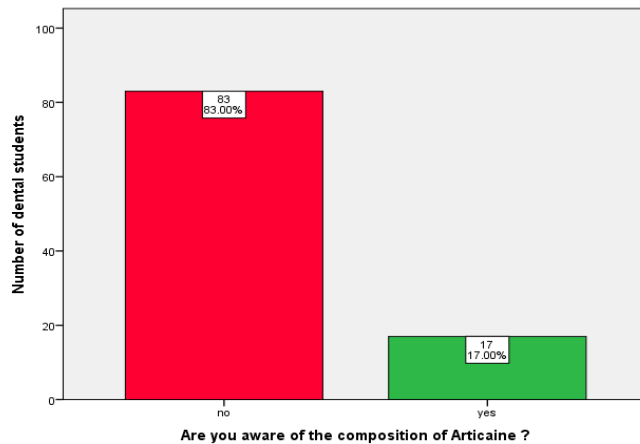


Fig. 7. The graph shows the distribution of dental students who were aware of the composition of articaine. The X-axis shows those who were aware and Y-axis shows the number of students who were aware. 83% were not aware (red), 17% were aware (green)

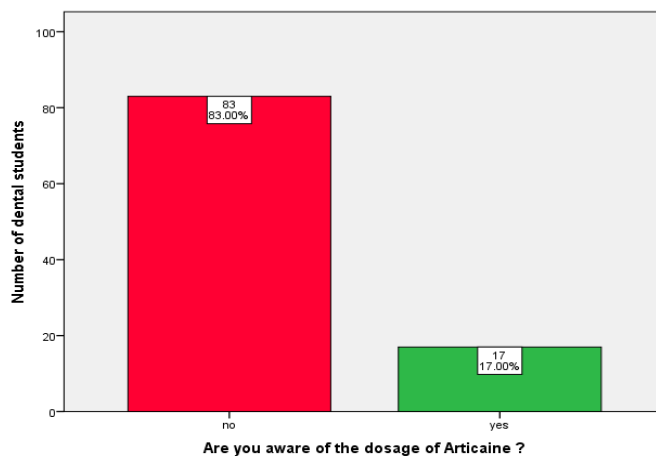


Fig. 8. The graph shows the distribution of dental students who were aware of the dosage. The X-axis shows those who were aware and Y-axis shows the number of students who were aware .83% were not aware (red), 17% were aware (green)

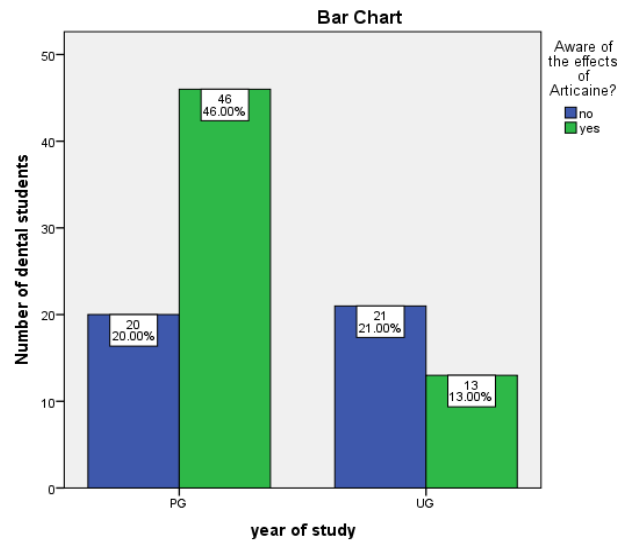


Fig. 9. Bar graph showing the association between year of study and awareness of the effects of articaine. X axis represents the year of study and Y-axis awareness of the effects of articaine

The awareness was more among the postgraduates about articaine compared to undergraduate students with a statistically significant difference. (Pearson Chi-square Test; $P=0.01$, $P<0.05$)

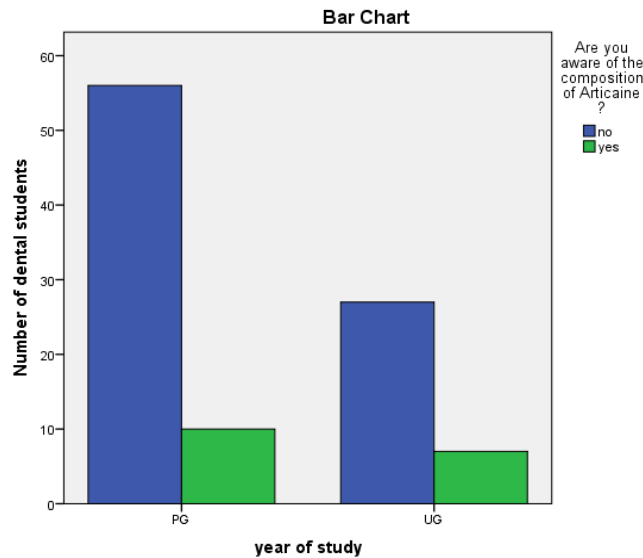


Fig. 10. Bar graph showing the association between year of study and awareness of the composition of articaine. X axis represents the year of study and Y-axis awareness of the composition of articaine

The awareness was more among the postgraduates about articaine compared to undergraduate students with a statistically significant difference. (Pearson Chi-square Test; $P=0.01$, $P<0.05$)

Some authors recommend performing at least two negative aspirations before depositing local anesthetics, and it seems that dentists often fail to appreciate the importance of applying such procedures to all injection events. This is especially worrying since high levels of toxicity

can be achieved by the accidental intravascular injection of local anesthetics [20].

The data collected from the google form were tabulated in SPSS and descriptive statistics were obtained. Out of the 100 dental students, 66% of

the dental students were postgraduates and 34% were undergraduates (Fig. 1).76% were male and 24% were female (Fig. 2). 59% of the dental students were aware of the effects of articaine and 41% of them were not aware (Fig. 3). 28% of dental students encountered patients with anaphylactic reaction due to Articaine 72% had not encountered it.

Failure of local anesthetics to be effective is related to many factors such as inaccurate

anatomical deposition of the local anesthetic solution or the use of inadequate amounts of solution [21]. The determination of local anesthetic dosage and dose calculation remains a problem for most of the dentists sampled here. The inability to understand and manipulate such important issues in dentistry is of considerable concern as it is likely to render dentists unsafe health providers concerned as it is likely to render dentists, unsafe health providers [21–23].

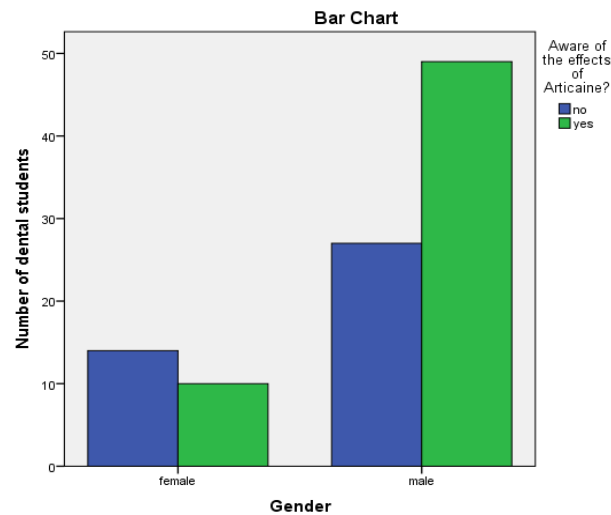


Fig. 11. Bar graph showing the association between gender and awareness of the effects of articaine. The X-axis represents gender and the Y-axis awareness of the effects of articaine
The awareness was more among the postgraduates about articaine compared to undergraduate students with a statistically significant difference. (Pearson Chi-square Test; P=0.01, P<0.05)

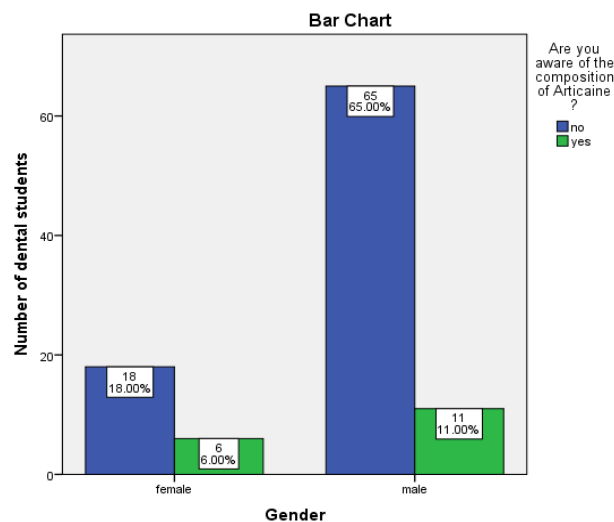


Fig. 12. Bar graph showing the association between gender and awareness of the composition of articaine. X axis represents gender and Y-axis awareness of the composition of articaine
The awareness was more among the postgraduates about articaine compared to undergraduate students with a statistically significant difference. (Pearson Chi-square Test; P=0.01, P<0.05)

Although there may be controversy regarding its safety and advantages in comparison to other local anesthetics, there is no conclusive evidence demonstrating neurotoxicity or significantly superior anesthetic properties of articaine for dental procedures. Therefore, at this time, the decision to use articaine cannot be based on any convincing evidence of superiority over other LA drugs, rather the choice will be based on the personal preference and experiences of individual clinicians.[24]

4. CONCLUSION

Within the limitations of this study, the majority of the respondents know to some extent about Articaine. The knowledge and awareness about the use of articaine as a local anesthetic agent is moderate among the dental students. So appropriate education strategies have to be implemented, to update them with recent drugs and technology. Articaine is a relatively safe and effective local anesthetic drug to use in all aspects of clinical dentistry for patients of all ages, with properties comparable to other common local anesthetic agents and clinicians can use them prudently according to the suitable clinical conditions.

CONSENT AND ETHICAL APPROVAL

The study was approved by the Institutional Ethics Board and Participants' written consent has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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